

USMC Environmental and Corrosion Control Issues

Andrew Sheetz
USMC CPAC Engineering
Manager



Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE NOV 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE USMC Environmental and Corrosion Control Issues			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Surface Warfare Center ? Carderock Division,9500 MacArthur Blvd,W. Bethesda,MD,20817			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the 15th Annual Partners in Environmental Technology Technical Symposium & Workshop, 30 Nov ? 2 Dec 2010, Washington, DC. Sponsored by SERDP and ESTCP.					
14. ABSTRACT The United States Marine Corps (USMC) Corrosion Prevention and Control (CPAC) Program is responsible for corrosion control issues for all ground vehicles and support equipment. In this role, the CPAC Program addresses issues through three main areas: Applied Research Development, Testing and Engineering (RDT&E); Corrosion Control Guidance and Support During Acquisition; and Organizational Level Corrosion Maintenance on Fielded Systems. In each of these areas the CPAC Program is striving to reduce the cost and impact of corrosion while supporting the use of environmentally friendly and compliant materials. Currently the areas of greatest need for the USMC are for: Hydraulic Cylinder Coatings, Fasteners, Pretreatments and Primers. Each of these areas has presented a challenge to finding environmentally friendly alternatives to legacy materials or implementing those materials into vehicle production or repair processes. This presentation will discuss some of the challenges the USMC is facing in these areas, some of the internal progress towards implementing new technologies, how the CPAC Program is leveraging the successes of other services in these areas and our overall needs with respect to these issues.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 14	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

USMC ENVIRONMENTAL AND CORROSION CONTROL PERSPECTIVES – THE REDUCTION OF CR⁶⁺

MR. ANDREW SHEETZ

Naval Surface Warfare Center – Carderock Division

9500 MacArthur Blvd.

W. Bethesda, MD 20817

(301) 227-5037

andrew.sheetz@navy.mil

CO-PERFORMERS: Matthew Koch (Marine Corps Systems Command);

John Repp (Elzly Technology)

The United States Marine Corps (USMC) Corrosion Prevention and Control (CPAC) Program is responsible for corrosion control issues for all ground vehicles and support equipment. In this role, the CPAC Program addresses issues through three main areas: Applied Research, Development, Testing and Engineering (RDT&E); Corrosion Control Guidance and Support During Acquisition; and Organizational Level Corrosion Maintenance on Fielded Systems. In each of these areas the CPAC Program is striving to reduce the cost and impact of corrosion, while supporting the use of environmentally friendly and compliant materials. Currently the areas of greatest need for the USMC are for: Hydraulic Cylinder Coatings, Fasteners, Pre-treatments and Primers. Each of these areas has presented a challenge to finding environmentally friendly alternatives to legacy materials or implementing those materials into vehicle production or repair processes. This presentation will discuss some of the challenges the USMC is facing in these areas, some of the internal progress towards implementing new technologies, how the CPAC Program is leveraging the successes of other services in these areas and our overall needs with respect to these issues.

CPAC Program



- The CPAC program is the manager for corrosion control issue within the Marine Corps
- CPAC provides support to the Marine to reduce the burden cause by corrosion through
 - Applied RDT&E to evaluate new technologies
 - Acquisition support on new systems
 - Organizational maintenance activities

CPAC Program



- CPAC is the voice of the Marines
- Annually hold a 3-day Working Group for Active Duty Marines
 - Display accomplishments
 - Voice concerns
 - Communicate policy
 - Identify opportunities and priorities
- Field Service Representatives (FSRs) at all major installations and for reserve units

Leading Issues for the USMC

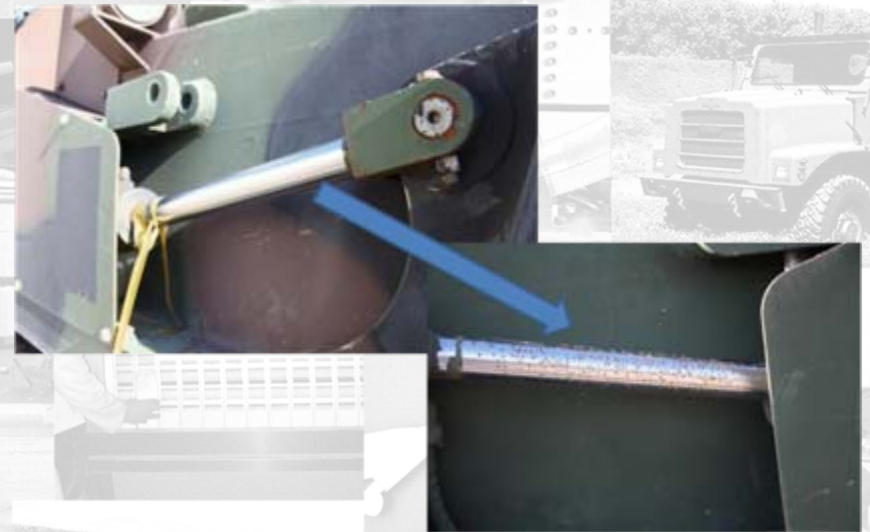


- Hydraulic cylinders
- Fasteners
- Environmentally friendly pre-treatments
- More durable primers

Hydraulic Cylinders



- Coating performance and quality leading issue
- Classical pitting corrosion of porous platings
- “Crap shoot” how plating will perform
- Corrosion causes damage to seals and failure of hydraulic system



Two similar aged M9 ACE vehicles, one with intact chrome plating, one with heavily pitted cylinder rod.

Hydraulic Cylinders



- CPAC has looked into alternative coatings and processes
- Potential environmental benefits
- Some possible performance benefits
- Larger issue appears to be quality and consistency
 - How do we eliminate variations in process?
 - What are the right ways to evaluate and ensure quality?
 - The real savings may be from improving overall performance.

Fasteners



Black oxide steel fastener in MRAP floorboards
~20 min per fastener to remove

- Same issues, different service
 - Prevalence of cadmium
 - Use of hexavalent chromium
 - Potential incompatibilities with alternatives
 - Use of non-corrosion resistant hardware in harsh environments

Fasteners



- Fully support DoD Cr⁶⁺ policy memo
- Endorse the use on non-chrome and trivalent-chrome alternatives
- Favor non-cadmium hardware
- Concern with logistics and supply chain of many alternatives

Pre-treatments



- Repainting is a large part of the Marine Corp's corrosion control strategy
- Established Corrosion Repair Facilities (CRFs)
 - Each major installation (4 centers)
 - Mobile CRFs for reserve units and overflow capacity
- Annually repainting 5,000-7,000 vehicles
- Spot touch-up operations on fielded systems

Pre-treatments



- Current operations is not to use pre-treatments
- Facilities not permitted / allowed to use Cr^{6+} containing products
- Perform abrasive blasting where possible
- Mechanical sanding also used
- Pre-treatments desired to enhance performance of primers / promote adhesion

Smooth grinder / sanded surface prior to painting

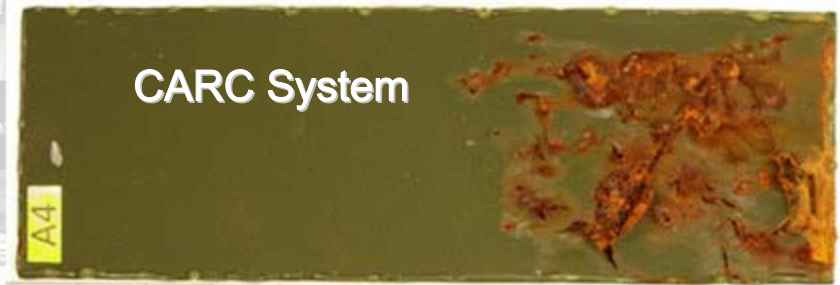


Primers

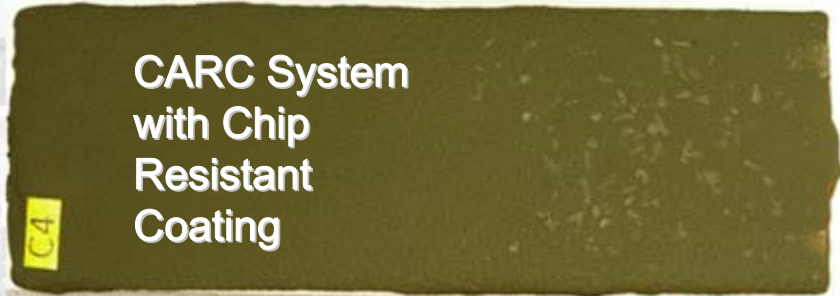


- CARC primers are thin, don't withstand abrasion / impact and only provide barrier protection
- Have enhanced our systems with supplemental materials
 - Zinc-rich coatings
 - Chip resistant coatings
- Proven to be effective with the CARC system
- Exploring other applications and materials

CARC System



CARC System
with Chip
Resistant
Coating



USMC User Perspective



- What is the user's perspective?
- They want a system that works
 - Low cost of ownership
 - Low maintenance burden
 - Minimizes exposure risk
 - Is available to perform the mission at hand
- CPAC's focus is to provide the system that works
- We work on the details and specifics and provide the Marine a vehicle ready to go

